

CLAIMS

- 1 1. A method for improving utilization of a data link coupled to a network, wherein
2 the data link is associated with one or more data flows carried on the data link, the
3 method comprising the steps of:
4 generating scores for one or more of the data flows;
5 maintaining a scorecard of the generated scores;
6 determining if the data link is idle;
7 if so, identifying the data flow associated with the highest score in the score card;
8 and
9 transferring data associated with the identified data flow onto the data link.
- 1 2. A method as defined in claim 1 comprising the steps of:
2 acquiring attribute information associated with a data flow; and
3 generating a score based on the attribute information.
- 1 3. A method as defined in claim 2 wherein the attribute information contains rate
2 information associated with the data flow.
- 1 4. A method as defined in claim 3 comprising the steps of:
2 determining if the rate information contains an excess rate component; and
3 if so, generating the score using the rate information.
- 1 5. A method as defined in claim 1 comprising the steps of:
2 determining if the scorecard is full;
3 if so, determining if a generated score is greater than a score contained in the
4 scorecard; and
5 if so, replacing the lowest score in the scorecard with the generated score.
- 1 6. A method as defined in claim 1 comprising the steps of:
2 determining if the scorecard is full; and

3 if the scorecard is not full, adding the generated score to the scorecard.

1 7. A method as defined in claim 1 wherein each data flow is associated with a hier-
2 archy that represents a hierarchy of the data link.

1 8. A method as defined in claim 7 comprising the steps of:
2 determining if a hierarchy associated with a data flow matches a hierarchy associ-
3 ated with a score in the scorecard;
4 if so, determining if a generated score is greater than the matching score in the
5 scorecard; and
6 if so, replacing the matching score in the scorecard with the generated score.

1 9. An apparatus for improving utilization of a data link coupled to a network com-
2 prising:
3 one or more queues configured to hold data;
4 a queue manager coupled to the queues and configured to dequeue the data from
5 the queues and transfer the data onto the data link;
6 auxiliary queue logic coupled to the queue manager and configured to generate
7 scores for one or more of the queues, the auxiliary queue logic further configured to
8 maintain a scorecard of the generated scores and notify the queue manager of a queue
9 associated with the highest score in the scorecard to cause the queue manager to dequeue
10 data from the queue when the link becomes idle.

1 10. An apparatus as defined in claim 9 comprising:
2 calendar queue logic coupled to the auxiliary queue logic and configured
3 to notify the auxiliary queue logic when the data link becomes idle.

1 11. An apparatus as defined in claim 9 comprising:
2 a scheduler coupled to the auxiliary queue logic and configured to maintain at-
3 tribute information associated with the queues.

1 12. An apparatus as defined in claim 11 wherein the auxiliary queue logic is config-
2 ured to acquire the attribute information associated with the queues from the scheduler
3 and use the attribute information to generate scores for the queues.

1 13. An apparatus as defined in claim 12 wherein the attribute information includes
2 rate information associated with the queue.

1 14. An apparatus as defined in claim 13 wherein the rate information includes an ex-
2 cess rate component.

1 15. An apparatus as defined in claim 11 wherein the scorecard is a data structure
2 comprising one or more entries, and wherein each entry contains a score field configured
3 to hold a generated score and a queue identifier (QID) field configured to hold a QID as-
4 sociated with a queue.

1 16. An apparatus as defined in claim 15 wherein the auxiliary queue logic is config-
2 ured to acquire attribute information and a QID associated with a queue, generate a score
3 associated with the queue using the attribute information, and place the score and QID in
4 the score and QID fields, respectively, of an entry contained in the scorecard.

1 17. A system for improving utilization of a data link coupled to a network, wherein
2 the data link is associated with one or more data flows carried on the data link, the system
3 comprising:

4 means for generating scores for one or more of the data flows;
5 means for maintaining a scorecard of the generated scores;
6 means for determining if the data link is idle;
7 means for identifying the data flow associated with the highest score in the score
8 card; and
9 means for transferring data associated with the identified data flow onto the data
10 link.

- 1 18. A system as defined in claim 17 comprising:
2 means for acquiring attribute information associated with a queue; and
3 means for generating a score based on the attribute information.
- 1 19. A system as defined in claim 17 comprising:
2 means for determining if a generated score is greater than a score contained in the
3 scorecard; and
4 means for replacing the lowest score in the scorecard with the generated score if
5 the generated score is greater than a score contained in the scorecard.
- 1 20. A computer readable medium comprising computer executable instructions for
2 execution in a processor, the medium comprising instructions for:
3 generating scores for one or more of data flows;
4 maintaining a scorecard of the generated scores;
5 determining if a data link is idle;
6 if so, identifying a data flow associated with highest score in the score card; and
7 transferring data associated with the identified data flow onto the data link.